

**BASIC ELECTRICITY AND  
ELECTRONICS**

**STUDENT HANDOUT  
NO. 210**

**SUMMARIES  
PROGRESS CHECKS  
FOR  
MODULES**

**24 LESSON 1**

**JUNE 1984**

SUMMARY  
LESSON 1

Introduction to Clippers

A clipper or limiter (both terms mean the same thing) is little more than a half wave rectifier. Using a diode, resistor, and sometimes a DC potential, a clipper/limiter can be used to eliminate the positive or negative alternation of an input waveform or can clip a desired amount from either alternation. In a circuit where the voltage limits are extremely critical, a clipper may be employed as a safety device. In this lesson you will be introduced to five types of clippers: (see illustration on next page) series positive; series negative, parallel positive, parallel negative; and parallel positive and negative clippers.

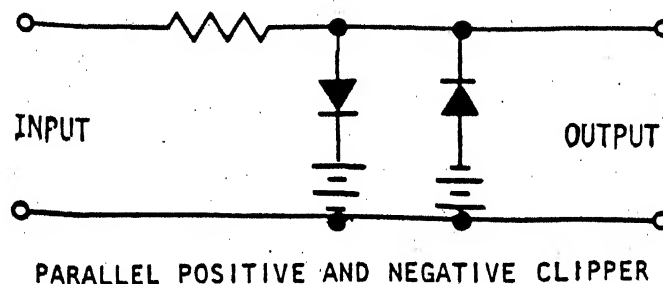
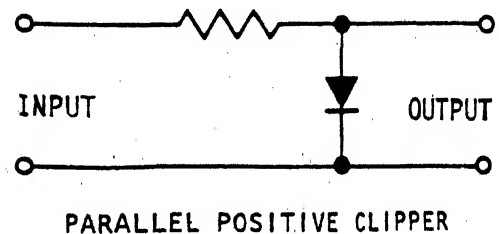
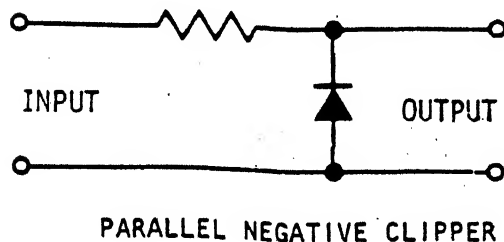
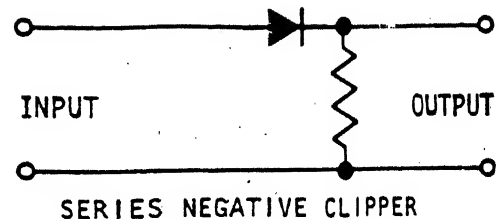
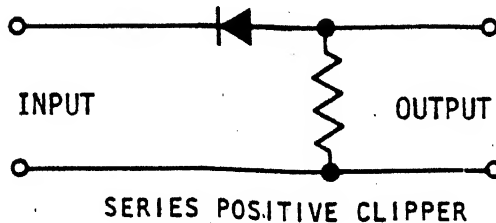
Since the diode is actually the limiting component, its location with respect to the signal flow and its polarity are the factors that determine circuit configuration. In the series clipper, the diode is in series with the input; in parallel clippers, the diode is in parallel with the output.

Remembering that a diode will pass current in only one direction, and that the anode (arrow) of the diode must be less negative (more positive) with respect to the cathode (vertical line) to make the diode conduct, you can look at the waveform as applied to the diode and determine what the output will be.

In a series clipper the diode must be forward biased in order to obtain an output. In a parallel clipper, if the diode is forward biased the signal will be shorted to the reference voltage. So in order to obtain an output the diode must be reverse biased.

To clip only a portion of either alternation a DC potential is placed in parallel with the output. This potential, depending upon its polarity, will keep the diode conducting or cut-off until the input waveform exceeds the DC potential.

To clip both alternations, two diodes are utilized in a parallel configuration. Actually this circuit is nothing more than a combination of two parallel clippers with DC aiding reverse bias.



AT THIS POINT, YOU MAY PROCEED TO THE JOB PROGRAM. IF YOU FEEL THAT YOU HAVE FAILED TO UNDERSTAND ALL, OR MOST, OF THIS LESSON, SELECT AND USE ANOTHER WRITTEN MEDIUM OF INSTRUCTION, AUDIO/VISUAL MATERIALS (IF APPLICABLE), OR CONSULTATION WITH YOUR LEARNING CENTER INSTRUCTOR, UNTIL YOU UNDERSTAND THE MATERIAL IN THIS LESSON.

AUDIO VISUAL RESPONSE SHEET

Lesson I

INTRODUCTION TO CLIPPERS

1. DRAW THE OUTPUT.
2. DRAW THE OUTPUT.
3. DRAW THE OUTPUT AND LABEL THE VOLTAGE LEVELS.
4. A B C D (CIRCLE ONE)
5. DRAW AND NAME THE CIRCUIT.
6. A B (CIRCLE ONE)
7. A PARALLEL POSITIVE CLIPPER  
B PARALLEL NEGATIVE CLIPPER
8. DRAW AND NAME THE CIRCUITS. LABEL THE VOLTAGE LEVELS
9. DRAW THE OUTPUT AND LABEL THE VOLTAGE LEVELS

\_\_\_\_\_ V  
P-P

JOB PROGRAM  
FOR  
LESSON I  
PART I

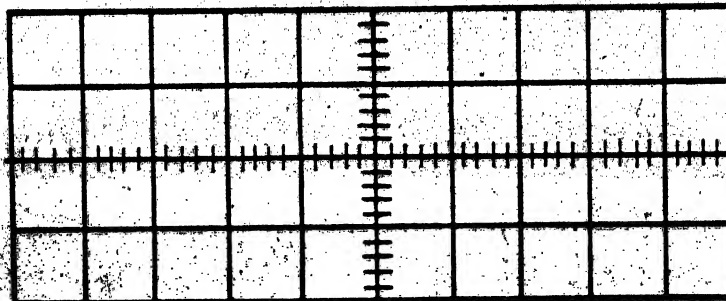
Clippers

EQUIPMENT AND MATERIAL

1. Device 6F16 - TEMPLATE D
2. Oscilloscope
3. 1X test probe (2)
4. Patch Cords (2)

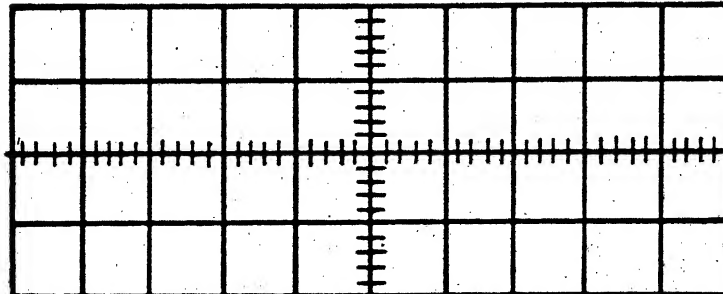
PROCEDURE

- I. Set up the oscilloscope for dual trace operation.
  - a. DISPLAY MODE to "Chop" and obtain line traces for both channels.
  - b. Set the VERTICAL POSITION channel "1" to (+) 1 div and channel "2" to (-) 1 div.
  - c. Set TRIGGER SOURCE to line.
  - d. Set TIME/DIV equal to 5 msec/div
  - e. Set channel "1" and "2" VOLTS/DIV equal to 10v/div
  - f. Set channel "1" and "2" AC/DC switches to "DC".
- II. Set up device 6F16 as follows:
  - a. Use Template D and the parts called for on this template.
  - b. Energize the 6F16 using the line cord.
- III. 1. Connect one of the test probes to channel "1" and the other one to channel "2". Connect the channel "1" probe to the clipper circuit input. Observe and draw the input waveform.



How much peak-to-peak voltage is applied to the clipper circuit? \_\_\_\_\_

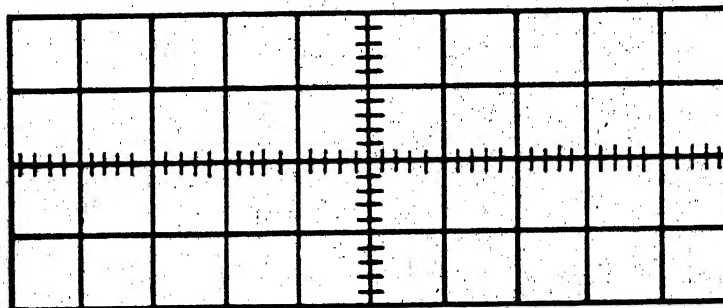
2. Now connect the channel "2" test probe to the clipper output.  
(To the right side of the diode or top of the resistor.) Observe and draw the output waveform.



What kind of clipper is this? \_\_\_\_\_

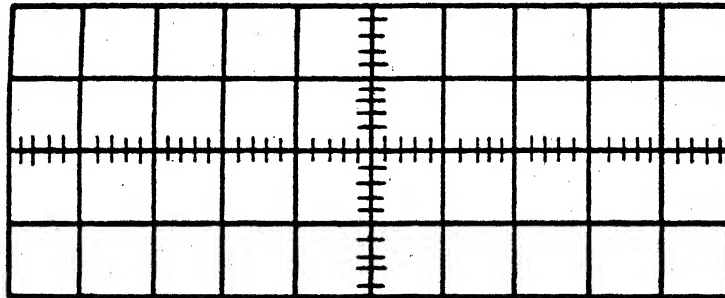
3. Secure the power (unplug the power cord - FROM THE WALL SOCKET -) and reverse the diode. Before you energize the device determine what kind of clipper this is. \_\_\_\_\_

Now, plug the line cord back in and draw the output waveform.



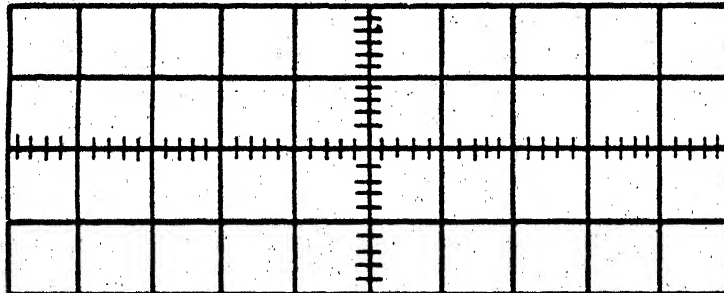
Were you right? \_\_\_\_\_

4. Okay, now let's add some bias. Secure the power, and remove the shorting strip below the resistor. Using one of the patch cords, connect the negative side of the battery to the hole right below the resistor (top hole). Using the other patch cord, connect the positive side of the battery to the bottom hole. Re-energize the 6F16 device, and draw the output waveform displayed on the oscilloscope.



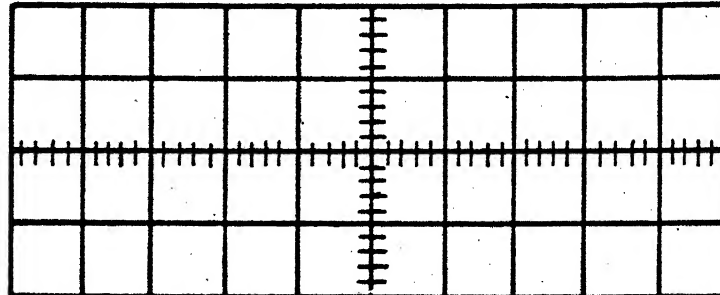
What kind of clipper is this? \_\_\_\_\_

5. De-energize the 6F16 device. Now, reverse the patch cords so the negative side of the battery is connected to the bottom hole and the positive side of the battery is connected to the top hole. Re-energize the 6F16 device, and draw the output waveform displayed on the oscilloscope.



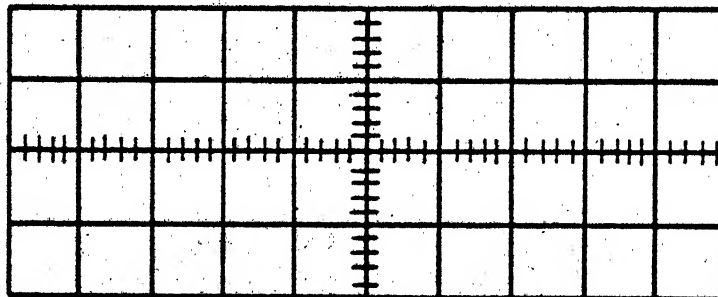
What kind of clipper is this? \_\_\_\_\_

6. Now, let's make some other kinds of clippers. All you have to do is reverse the diode again. Secure the power before removing the diode. Re-energize the 6F16, and draw the output waveform as displayed on the oscilloscope.



What kind of clipper is this? \_\_\_\_\_

7. De-energize the 6F16, and reverse the polarity of the battery by connecting the negative side of the battery to the top hole, and the positive side of the battery to the bottom hole. Re-energize the 6F16, and draw the output waveform displayed on the oscilloscope.



What kind of clipper is this? \_\_\_\_\_

Secure the power to the 6F16 device, and return all equipment to it's proper stowage.

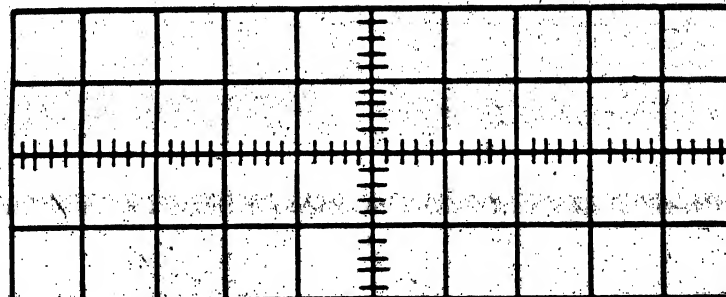
CHECK YOUR RESPONSES TO THIS JOB PROGRAM WITH THE ANSWER SHEET. IF YOUR RESPONSES AGREE WITH THE ANSWER SHEET, YOU SHOULD PROCEED TO THE NEXT JOB PROGRAM. IF YOUR RESPONSES DO NOT AGREE OR IF YOU FEEL YOU HAVE FAILED TO UNDERSTAND ALL, OR MOST, OF THIS JOB PROGRAM, REVIEW THE PROCEDURES OF THIS JOB PROGRAM, ANOTHER MEDIUM OF INSTRUCTION, OR AUDIO/VISUAL MATERIALS OR CONSULTATION WITH LEARNING CENTER INSTRUCTOR UNTIL YOUR RESPONSES DO AGREE.



## Clippers

1. Device 6F16 TEMPLATE E
2. Oscilloscope
3. 1X test probe (2)
4. Patch Cords (2)

1. Energize the oscilloscope, and set it up for dual trace operation.
2. Set the oscilloscope controls as outlined in Job Program Twenty Four-1-1.
3. Set up the 6F16 device as follows:
  - a. Using TEMPLATE E, and the parts called for on the template, build the parallel clipper circuit. Using the power cord, connect the 6F16 to a power outlet. DO NOT ENERGIZE 6F16 YET.
4. Connect one the test probes to Channel 1 of the oscilloscope, and the other test probe to Channel 2.
5. Connect Channel 1 test probe to the clipper circuit input, and energize the 6F16 device. Observe the input waveform. It should be the same as in Job Program Twenty Four-1-1.
6. Connect the Channel 2 probe to the Clipper circuit output. The output is taken from the right side of the resistor or the top of the diode. Observe and draw the output waveform.

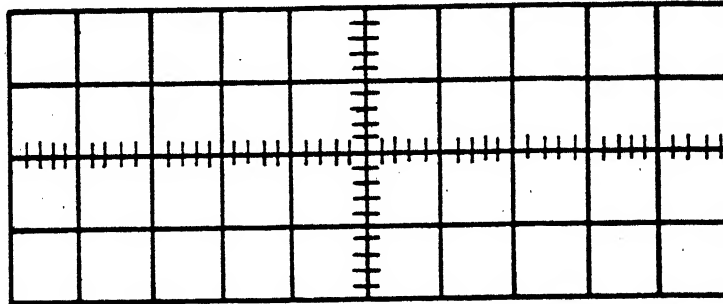


What kind of parallel clipper is this?

J.P.

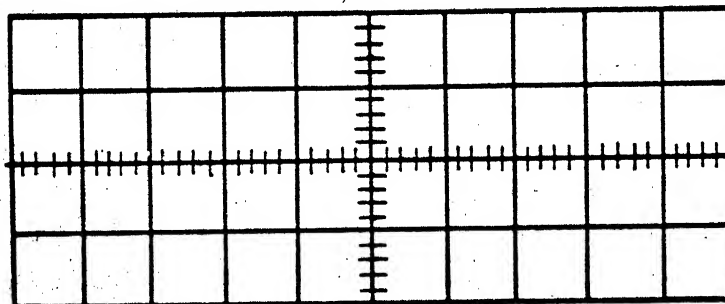
Twenty Four-1-2

7. De-energize the 6F16, and reverse the diode. Re-energize the 6F16, and connect the Channel 2 probe to the output. Observe and draw the output waveform as displayed on the oscilloscope.



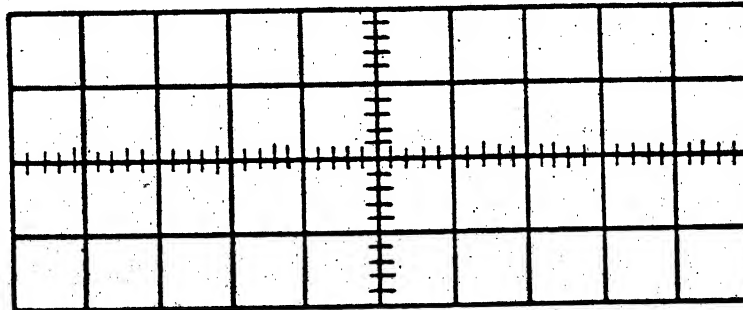
What kind of parallel clipper is this? \_\_\_\_\_

8. Time for bias again. Secure the power to the 6F16, and remove the shorting strip below the diode.
9. Using one of the patch cords, connect the negative side of the battery to the hole directly below the diode (top hole). Using the other patch cord, connect the positive side of the battery to the bottom hole.
10. Re-energize the 6F16, and connect the Channel 2 probe to the output of the clipper. Observe and draw the output waveform.



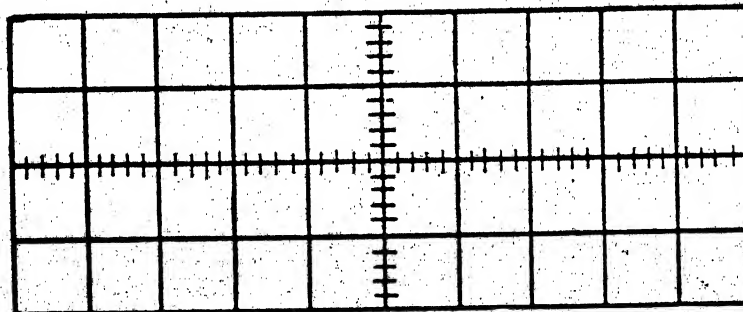
What kind of parallel clipper is this? \_\_\_\_\_

11. De-energize the 6F16. Now, reverse the patch cords so that the positive side of the battery is connected to the top hole, and the negative side of the battery is connected to the bottom hole.
12. Connect the Channel 2 probe to the clipper output, and re-energize the 6F16. Observe and draw the output waveform.



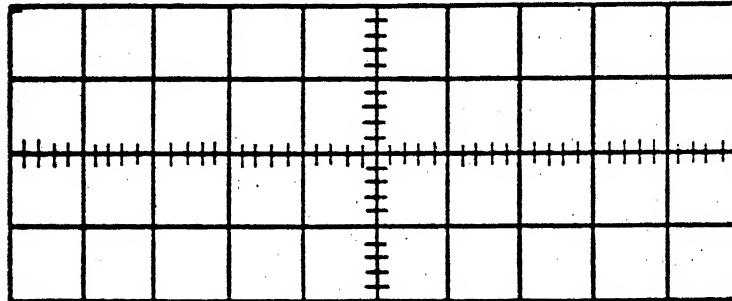
What kind of clipper is this? \_\_\_\_\_

13. De-energize the 6F16, and reverse the diode. Re-energize the 6F16. Observe and draw the output waveform.



What kind of clipper is this? \_\_\_\_\_

14. Now, reverse the patch cords again so that the negative side of the battery is connected to the top hole, and the positive side of the battery is connected to the bottom hole. Observe and draw the output waveform.



What kind of parallel clipper is this? \_\_\_\_\_

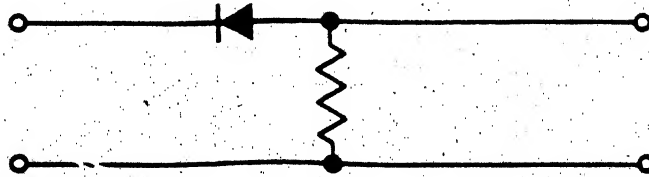
This concludes the job programs on clippers.

Secure the power to the 6F16, and return all equipment to it's proper stowage.

CHECK YOUR RESPONSES TO THIS JOB PROGRAM WITH THE ANSWER SHEET. IF YOUR RESPONSES AGREE WITH THE ANSWER SHEET, YOU MAY TAKE THE LESSON PROGRESS CHECK. IF YOUR RESPONSES DO NOT AGREE OR IF YOU FEEL YOU HAVE FAILED TO UNDERSTAND ALL, OR MOST OF THIS JOB PROGRAM, REVIEW THE PROCEDURES OF THIS JOB PROGRAM, ANOTHER WRITTEN MEDIUM OF INSTRUCTION, AUDIO/VISUAL MATERIALS OR CONSULTATION WITH YOUR LEARNING CENTER INSTRUCTOR UNTIL YOUR RESPONSES DO AGREE.

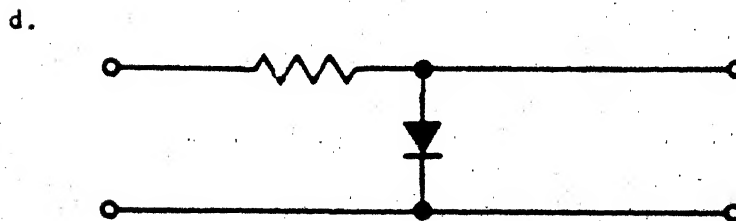
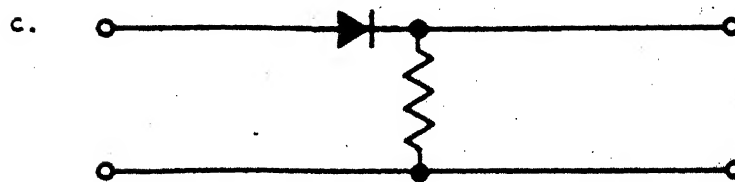
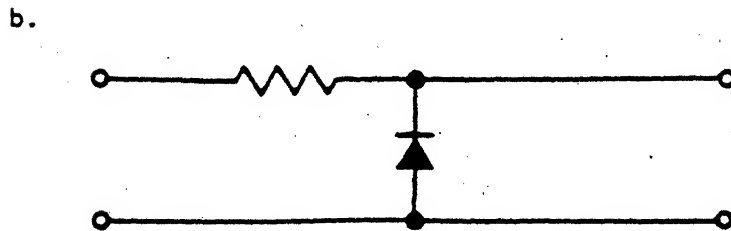
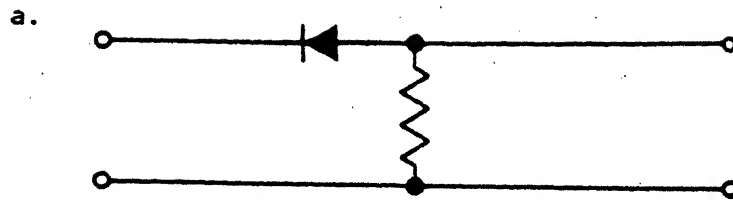
PROGRESS CHECK  
LESSON 1Clippers

1. A positive clipper removes the \_\_\_\_\_ portion of the input waveform.
2. A negative clipper removes the \_\_\_\_\_ portion of the input waveform.
3. In a series clipper, the diode is in series with the \_\_\_\_\_
4. The below illustrated circuit is an example of a \_\_\_\_\_ clipper.



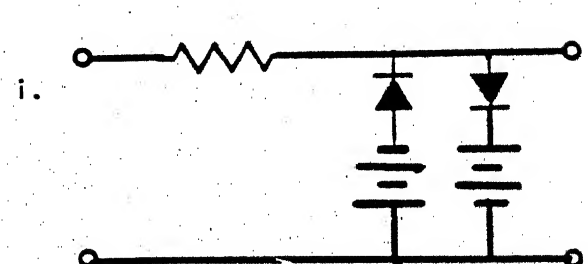
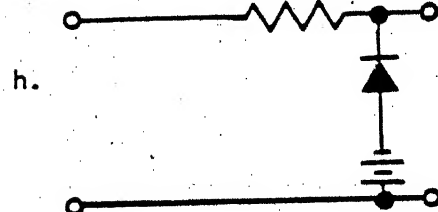
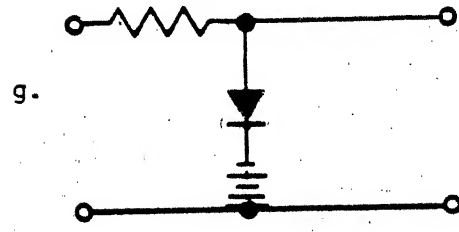
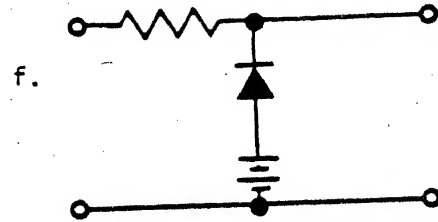
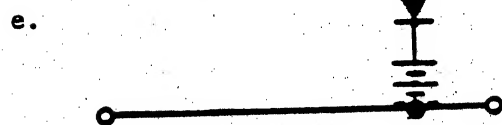
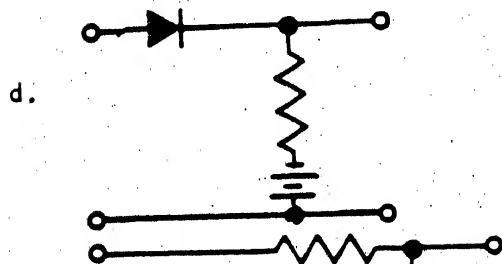
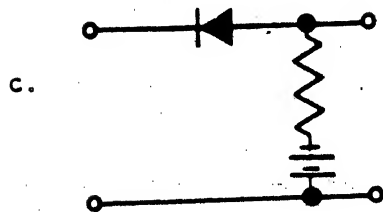
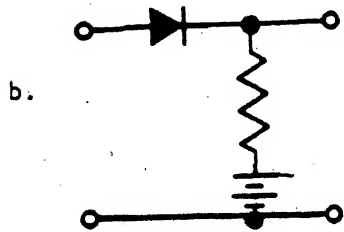
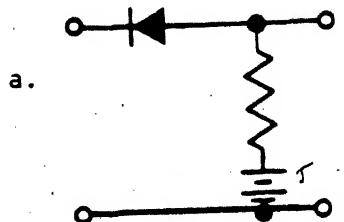
5. To clip only a portion of one alternation, a \_\_\_\_\_ potential could be added to the circuit.

6. Which of the below circuits could represent a series negative clipper?



7. In a parallel clipper, the diode is in parallel with the \_\_\_\_\_.

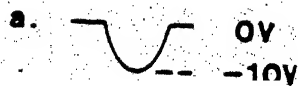
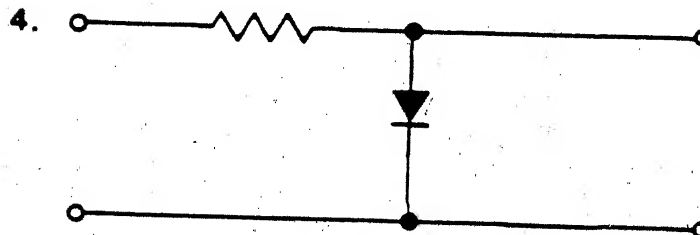
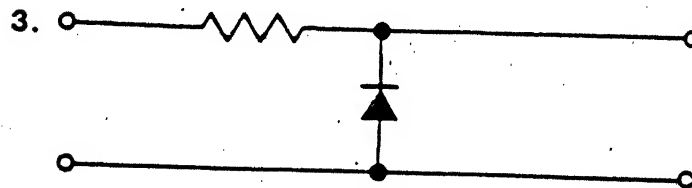
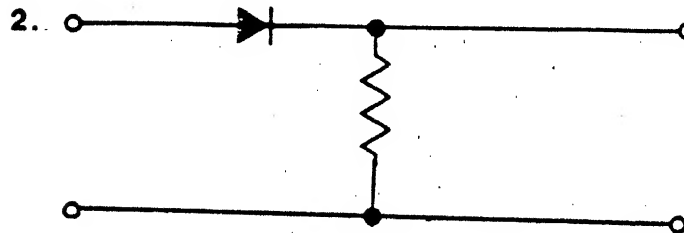
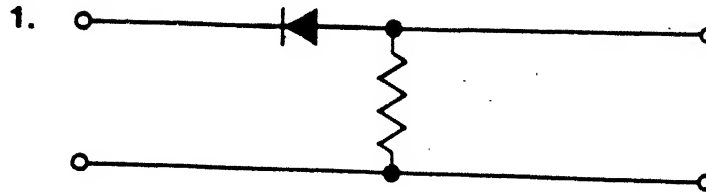
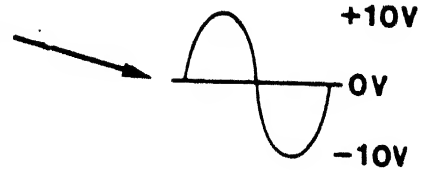
8. Match the below illustrated circuits with their correct titles.



1. series negative clipper with positive bias.
2. parallel positive clipper with negative bias.
3. parallel positive and negative clipper with positive and negative bias.
4. series positive clipper with positive bias.
5. parallel negative clipper with positive bias.
6. series negative clipper with negative bias.
7. parallel positive clipper with positive bias.
8. series positive clipper with negative bias.
9. parallel negative clipper with negative bias.

9. Match the output waveforms below with their respective circuits.

NOTE: All circuits have an input waveform of



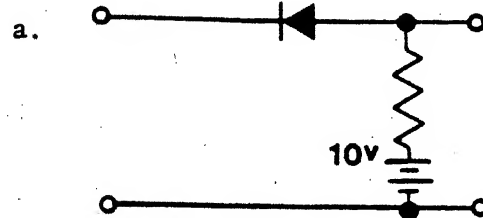
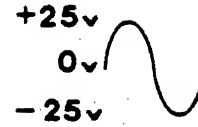


Progress Check

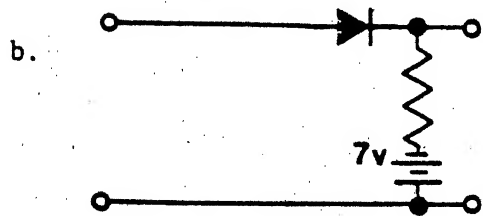
Twenty Four-1

10. Draw the output waveform for each clipper circuit illustrated below.

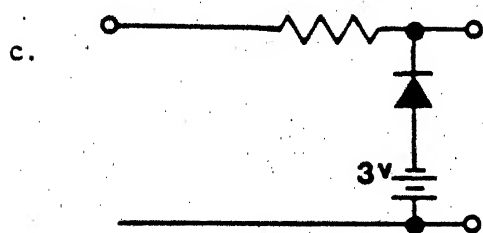
NOTE: All circuits have an input waveform of



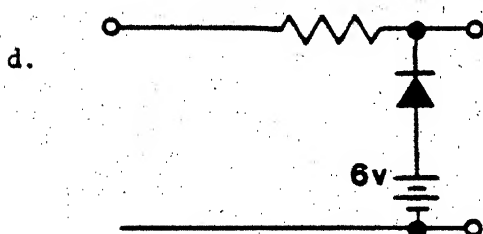

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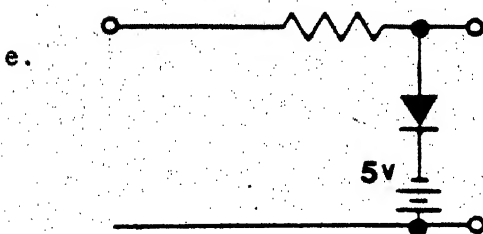

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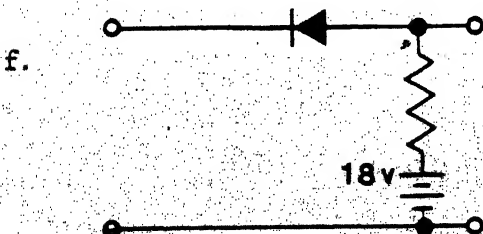

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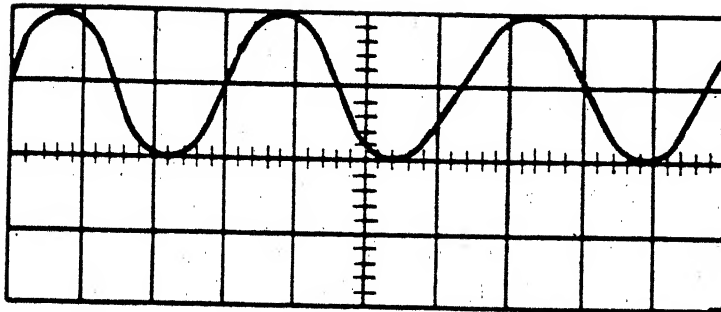

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CHECK YOUR RESPONSES TO THIS PROGRESS CHECK WITH THE ANSWER SHEET. IF YOU ANSWER ALL SELF-TEST ITEMS CORRECTLY, PROCEED TO THE NEXT LESSON. IF YOU FEEL YOU HAVE FAILED TO UNDERSTAND ALL, OR MOST, OF THE LESSON, SELECT AND USE ANOTHER WRITTEN MEDIUM OF INSTRUCTION, AUDIO/VISUAL MATERIALS (IF APPLICABLE), OR CONSULTATION WITH YOUR LEARNING CENTER INSTRUCTOR, UNTIL YOU CAN ANSWER ALL SELF-TEST ITEMS ON THE PROGRESS CHECK CORRECTLY.

ANSWER SHEET  
FOR  
JOB PROGRAM  
LESSON 1  
PART 1

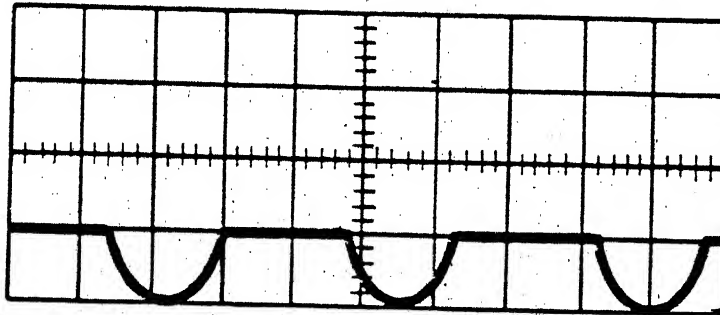
Clippers

1.



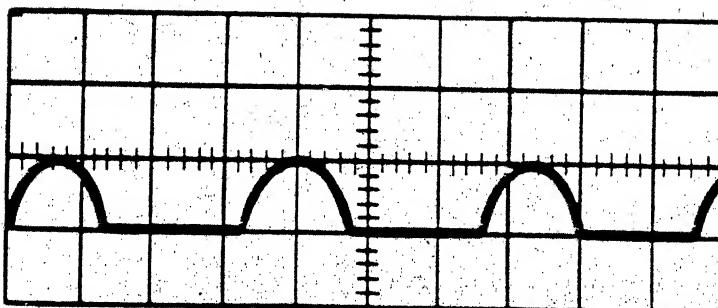
20 volts p-p

2.



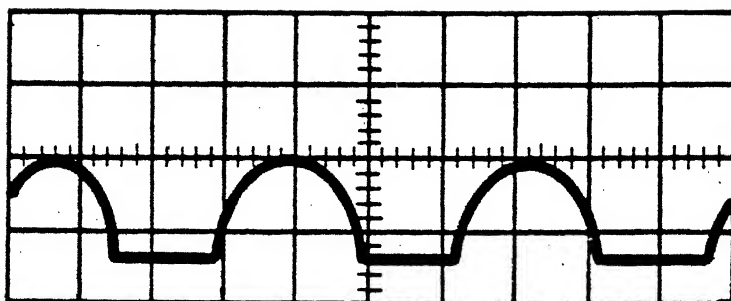
POSITIVE CLIPPER

3.



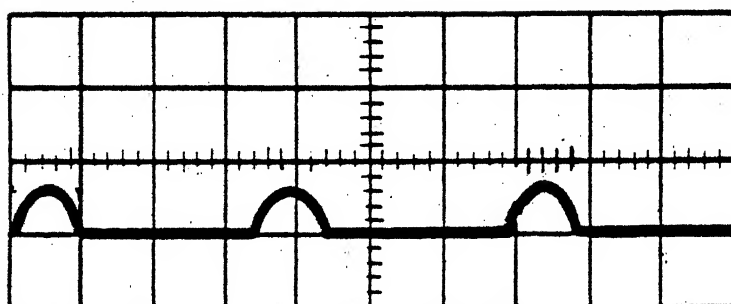
NEGATIVE CLIPPER

4.



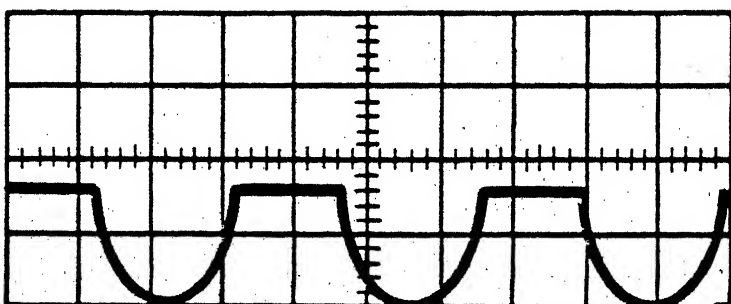
NEGATIVE CLIPPER with DC aiding forward bias

5.



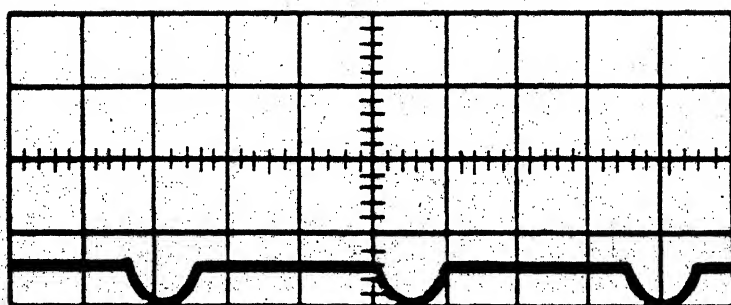
NEGATIVE CLIPPER with DC aiding reverse bias

6.



POSITIVE CLIPPER with DC aiding forward bias

7.

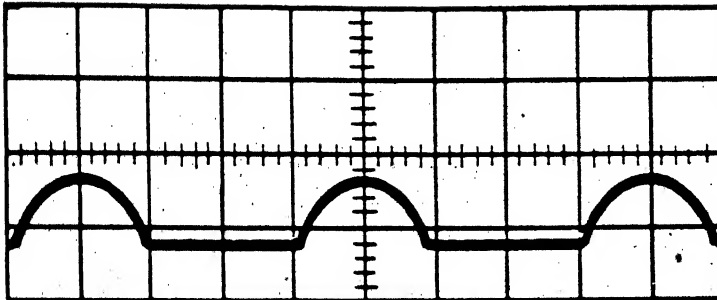


POSITIVE CLIPPER with DC aiding reverse bias

ANSWER SHEET  
FOR  
JOB PROGRAM  
LESSON 1  
PART 2

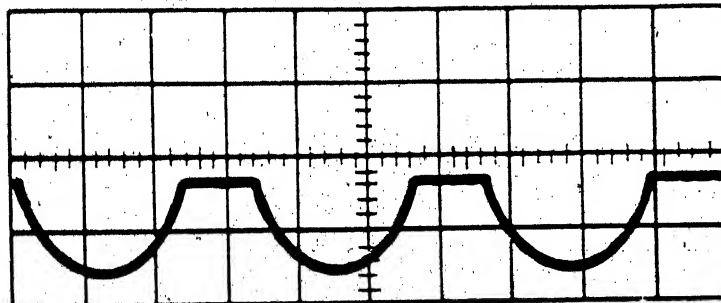
Clippers

1.



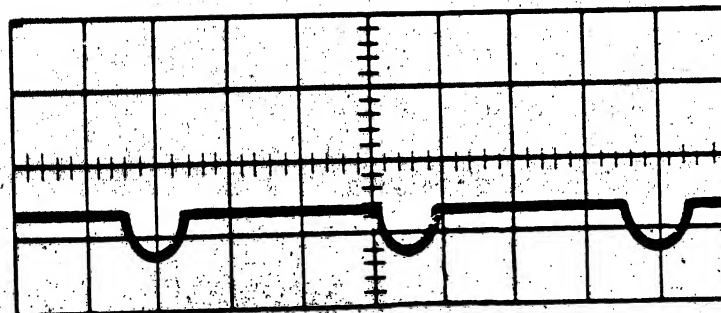
NEGATIVE

2.

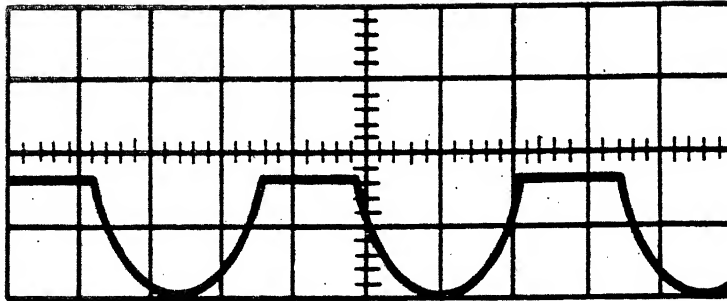


POSITIVE

3.

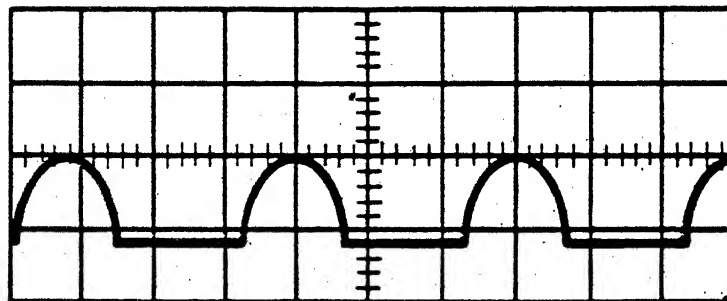


4.



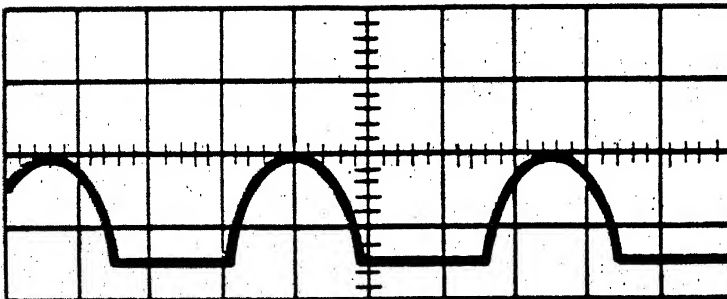
POSITIVE CLIPPER with DC aiding reverse bias

5.



NEGATIVE CLIPPER with DC aiding forward bias

6.



NEGATIVE CLIPPER with DC aiding reverse bias

ANSWER SHEET  
FOR  
PROGRESS CHECK  
LESSON 1

Clippers

<u>QUESTION NO.</u>	<u>CORRECT ANSWER</u>
1.	positive
2.	negative
3.	input
4.	series positive
5.	DC
6.	c.
7.	load or output
8.a.	4-series positive clipper with positive bias
b.	1-series negative clipper with positive bias
c.	8-series positive clipper with negative bias
d.	6-series negative clipper with negative bias
e.	7-parallel positive clipper with positive bias
f.	5-parallel negative clipper with positive bias
g.	2-parallel positive clipper with negative bias
h.	9-parallel negative clipper with negative bias
i.	3-parallel positive and negative clipper with positive and negative bias
9.	1-a, 2-b, 3-b, 4-a

ANSWER SHEET  
FOR  
PROGRESS CHECK  
LESSON 1 (Cont'd)

<u>QUESTION NO</u>	<u>CORRECT ANSWER</u>
0 a.	
b.	
c.	
d.	
e.	
f.	